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ADAPTABILITY OF SAFFLOWER (Carthamus tinctorius L.)

GENOTYPES TO SOME NEW ZEALAND ENVIRONMENTS

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ABSTRACT

Seven safflower (Carthamus tinctorius L.) genotypes were grown at three sites (Massey, Aorangi and Flockhouse) in the Manawatu area in years 1978 and 1979. Three additional genotypes from the world germplasm collection were included in the study in 1979. The experimental design was a randomized complete block with three replications.

The safflower genotypes were evaluated with respect to several morphological traits, and some important agronomic traits, such as yield, % oil content, % hull content and susceptibility to head rot disease. Data collected on seven safflower genotypes were analysed as a combined experiment with 3 sites and 2 years (Expt. I). The data available on 10 genotypes in 1979 were analysed separately with respect to ten important characters (Expt. II).

Of the 23 characters studied in Expt. I, the genotypic variance component (σ^2_G) was significant only for the following 6 characters: mid stem leaf length, primary head diameter, involucral bract length and length/width, bract spine index and susceptibility to head rot disease. The addition of 3 genotypes in Expt. II had a marked effect on the magnitude of σ^2_G component. Of the environmental components, site x year interaction effect was the most significant for the majority of traits.

Most of the characters studied in Expt. I showed significant genotype x environment interactions, and in most instances the second order interaction of genotype x site x year being highly significant. Adaptation analyses were performed following procedures of Finlay and Wilkinson (1963). The genotypes Leed and Dart with adaptation coefficients 1.52 and 1.75 respectively were specifically adapted to favourable environments with respect to yield. Cultivar 0-22 and Rio showed general adaptability to the same trait. For % oil content all genotypes except Rio showed general adaptability. Cultivar Rio was slightly specifically

adapted to favourable environments.

Two forms of broad sense heritabilities (full and restricted) were estimated. In Expt. I, relatively high restricted heritability estimates were obtained for the following traits: leaf length, primary head diameter, bract length and length/width, spine index and susceptibility to head rot disease. The heritability estimates obtained in Expt. II were higher than Expt. I, due to the additional genetic variability in the population. Of the additional traits studied in Expt. II, lodging and susceptibility to leaf spot disease, showed high heritability estimates.

Resistances to two fungal diseases - head rot (Botrytis cinerea Pers.) and leaf spot (Stemphylium/Alternaria species) - were assessed in field conditions. The leaf spot disease was detected only in the second year of this study. The cultivars VFSTP-1 and Partial-hull were highly susceptible to head rot disease. The two genotypes from safflower germplasm collection, PI 262437 and PI 306684 had considerable tolerance to leaf spot disease.

The optimum plot allocation study indicated that, disregarding costs, an allocation of 2 years, 4 sites and 2 replications would be more efficient than the present allocation.

There was no significant correlation between spininess and bird damage. The % oil content and % hull content were negatively correlated at both phenotypic and genotypic levels. Susceptibility to the two diseases were negatively correlated with yield. The susceptibility to head rot disease also showed a significant negative correlation with the % oil content.

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TABLE OF CONTENTS

	Page
INTRODUCTION	1
CHAPTER 1. <u>LITERATURE REVIEW</u>	3
1.1 PHENOTYPIC ANALYSIS AND ASSUMPTIONS	3
1.2 HERITABILITY	5
1.3 EXPECTED GENETIC ADVANCE	10
1.4 GENOTYPE x ENVIRONMENT INTERACTION	11
1.4.1 Linear Regression Models	11
1.4.2 Stability	16
1.4.3 Independent Assessment of Environment	19
1.4.4 Reducing GxE Interaction	20
1.4.5 Multivariate Techniques	21
1.5 OPTIMUM PLOT ALLOCATION	22
1.6 SAFFLOWER	25
1.6.1 Origin and Related Species of Cultivated Safflower	25
1.6.2 Evaluation of Safflower Germplasm	26
1.6.3 Inheritance Studies	29
1.6.3.1 Inheritance of plant characteristics	30
1.6.3.2 Inheritance of seed characteristics	32
1.6.4 Breeding	34
CHAPTER 2. <u>MATERIALS AND METHODS</u>	36
2.1 NATURE OF THE EXPERIMENT	36
2.2 EXPERIMENTAL DESIGN	36
2.3 DESCRIPTION OF GENOTYPES	37
2.4 FIELD CONDITIONS	37
2.5 CHARACTERS STUDIED	37
2.5.1 Scales of Measurement	39
2.5.2 Character Measurements	39

	Page
2.5.2.1 Stem diameter (mm.)	39
2.5.2.2 Plant height (cm.)	40
2.5.2.3 Branching level (score 1-5)	40
2.5.2.4 Mid-stem leaf length and width (mm.)	40
2.5.2.5 Primary head diameter (mm.)	40
2.5.2.6 Bract characters	40
2.5.2.7 Establishment density	41
2.5.2.8 Flowering time (50%)	41
2.5.2.9 Bird damage (score 0-5)	41
2.5.2.10 Susceptibility to head rot disease (score 0-5)	41
2.5.2.11 Sprouting damage of harvested grain (score 0-5)	42
2.5.2.12 Lodging (score 0-5)	42
2.5.2.13 Susceptibility to leaf spot disease (score 0-5)	42
2.5.2.14 Yield and yield components	46
2.5.2.15 Percentage oil content of seed	46
2.5.2.16 Percentage hull content of seed	47
2.5.2.17 Iodine value of oil	47
2.6 STATISTICAL ANALYSIS	48
2.6.1 Phenotypic Models Used	49
2.6.2 Pooled Analysis of Variance	50
2.6.3 Comparison of Genotypic Means	53
2.6.4 Heritability Estimates	54
2.6.5 Adaptation Analysis	55
2.6.6 Optimum Plot Allocation	57
2.6.7 Correlation Coefficients	58
CHAPTER 3. <u>RESULTS AND DISCUSSION</u>	59
3.1 HETEROGENEITY OF EXPERIMENTAL ERRORS	59
3.2 GRAND MEANS AND COEFFICIENTS OF VARIATION (CV)	64
3.3 VARIANCE COMPONENT ESTIMATES AND THEIR SIGNIFICANCES	65
3.3.1 Variance Components Involving Environmental Effects	65
3.3.2 Variance Components Involving Genotypic Effects	73

	Page
3.4 GENOTYPIC MEANS	76
3.5 HERITABILITY ESTIMATES	81
3.6 ADAPTATION ANALYSIS	86
3.7 OPTIMUM PLOT ALLOCATION	93
3.8 PHENOTYPIC AND GENOTYPIC CORRELATIONS	102
CHAPTER 4. <u>GENERAL DISCUSSION</u>	107
4.1 CONTROL OF EXPERIMENTAL ERROR	107
4.2 HETEROGENEITY OF EXPERIMENTAL ERRORS	108
4.3 VARIANCE COMPONENT ESTIMATES	109
4.4 COMPARISON OF GENOTYPIC MEANS	110
4.5 HERITABILITY ESTIMATES	111
4.6 ADAPTATION ANALYSIS	112
4.7 PHENOTYPIC AND GENOTYPIC CORRELATIONS	113
4.8 DISEASE ASPECTS	114
4.9 BREEDING PROSPECTS	116
CONCLUSIONS	120
BIBLIOGRAPHY	122
APPENDIX	135

LIST OF TABLES

Table	Page
2.1 Description of genotypes.	38
2.2 Sowing dates for the three sites.	38
2.3 Degrees of freedom, expectations of mean squares and F-ratios for Model I.	51
2.4 Degrees of freedom, expectations of mean squares and F-ratios for Model II.	52
3.1 Expt. I. Abbreviations used, units of measurement, grand means and coefficients of variation (CV) for all characters studied.	60
3.2 Expt. II. Abbreviations used, units of measurement, grand means and coefficients of variation (CV) for the 10 traits.	61
3.3 Expt. I. The error variances of individual experiments, pooled error variance, and the significance of heterogeneity.	62
3.4 Expt. II. The error variances of individual experiments, pooled error variance, and the significance of heterogeneity.	63
3.5 Expt. I. Estimates of all variance components involving environmental effects only, together with their standard errors.	66
3.6 Expt. I. Estimates of all variance components involving genotypic effects, together with their standard errors.	68
3.7 Expt. I. Ratio of all variance component estimates to the relevant error variance, and their significances for the site x year model.	70
3.8 Expt. II. Estimates of all variance components and their standard errors for the ten traits studied in the pooled environments model.	71
3.9 Expt. II. Ratio of all variance component estimates to the relevant error variance, and their significances for the pooled environments model.	72
3.10 Comparison of genotypic means for five traits at Flockhouse in years 1978 ($\bar{X}_{i.k1}$) and 1979 ($\bar{X}_{i.k1_2}$).	74

Table		Page
3.11	Expt. I. Genotypic means ($\bar{X}_{i\dots}$), L.S.D. values and grand means (\bar{X}_{\dots}) for all the characters studied on 7 safflower genotypes in 3 sites over 2 years.	77
3.12	Expt. II. Genotypic means ($\bar{X}_{i\dots}$), L.S.D. values and grand means (\bar{X}_{\dots}) for ten traits studied on 10 safflower genotypes in 3 sites.	80
3.13	Expt. I. Comparison between mean genotypic yields of unsprayed and sprayed halves for the seven genotypes.	82
3.14	Expt. II. Comparison between mean genotypic yields of unsprayed and sprayed halves for the ten genotypes.	82
3.15	Expt. I. Estimates of heritability, full (\hat{h}^2) and restricted (\hat{h}^2'), their standard errors and coefficients of variation, based on variance component estimates from the pooled site x year model.	83
3.16	Expt. II. Estimates of broad sense heritability, full (\hat{h}^2) and restricted (\hat{h}^2'), their standard errors and coefficients of variation, based on variance component estimates from the pooled environments model.	85
3.17	Expt. I. Adaptation coefficients (b_i), their standard errors and significances, ratios to least ecovalance (R.L.E.) and R^2 values for characters showing significant GxE interactions.	87
3.18	Expt. I. The significances between adaptation coefficients (b_i) of individual genotypes for the trait yield ⁱ (unsprayed).	94
3.19	Expt. I. Optimum plot allocation as indicated by relative efficiencies for various combinations of blocks, sites and years for the character Sus. Bot.	97
3.20	Expt. I. Optimum plot allocation as indicated by relative efficiencies for various combinations of blocks, sites and years for the character Yld (US).	98
3.21	Expt. I. Optimum plot allocation as indicated by relative efficiencies for various combinations of blocks, sites and years for the character % hull content.	99

Table		Page
3.22	Expt. I. Optimum plot allocation as indicated by relative efficiencies for various combinations of blocks, sites and years for the character % oil content.	100
3.23	Expt. I. Phenotypic (r_p) and genotypic (r_g) correlation coefficients between some traits studied on seven genotypes in six environments.	103
3.24	Expt. II. Phenotypic (r_p) and genotypic (r_g) correlation coefficients between susceptibility to diseases (head rot and leaf spot) and other traits, based on data from ten genotypes at three environments.	106

LIST OF FIGURES

Figure		Page
3.1	Linear regression lines showing relationship between genotypic yield ($\bar{X}_{i.k}$) and environmental mean yield ($\bar{X}_{..k}$) for seven safflower genotypes grown at 3 sites in years 1978 and 1979.	95
3.2	Linear regression lines showing relationship between genotypic values for susceptibility to head rot disease ($\bar{X}_{i.k}$), and environmental means ($\bar{X}_{..k}$), for seven safflower genotypes grown at 3 sites in years 1978 and 1979.	96

LIST OF PLATES

Plate		Page
2.1	A safflower head at an early stage of infection by <u>Botrytis cinerea</u> Pers., causative organism of head rot disease.	43
2.2	A cross section of a safflower head infected with <u>Botrytis cinerea</u> Pers., showing disintegrating receptacle tissue at the base of seeds.	43
2.3	A safflower head at a later stage of infection by <u>Botrytis cinerea</u> Pers., showing extensive sporulation on the head and surrounding involucral bracts.	44
2.4	Safflower leaves infected with <u>Stemphylium</u> and <u>Alternaria</u> species causing leaf spot disease.	44
2.5	A stem portion of a safflower plant infected with <u>Stemphylium</u> and <u>Alternaria</u> species.	45
2.6	A safflower plant severely infected with leaf spot disease.	45